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EXAMINER	
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ART UNIT	PAPER NUMBER
2416	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/710,882	HALL ET AL.	
	Examiner	Art Unit	
	ANDREW LAI	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-12 and 14-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-12 and 14-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Examiner's Notes

In response to Examiner's Advisory Action of 9/26/2008 indicating the need of new searches for Applicant amended claims, Applicant filed RCE on 10/7/2008 with Independent claims amended prior to the Advisory Action. This Office Action addresses all of the claims with an emphasis on the newly added features in the amended Independent claims.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3-6, 8-12 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson (US 4,001,774) in view of Hare (US 2,379,800) and further in view of Fechalos (US 4,737,950).

Dawson discloses "a system for performing wellbore telemetry operations" (Abstract line 1) "through electromagnetic coupling between two insulated electric conductors" (Abstract lines 4-6) comprising:

- **With respect to Independent claims 1 and 12**

Regarding claim 1 (as best understood), *an apparatus for fixing latency of an operation* ("a communication link between a subsurface location in a well and the

surface", col. 2 lines 8-10) *within a deterministic region* (fig. 1 the region confined within the "tubular drill string 12", col. 2 line 58) *in a network* (fig. 1 "telemetry" system, col. 3 line 25) *in a downhole* (fig. 1 "borehole 17, col. 3 line 5) *drill string* (fig. 1 "tubular drill string 12", col. 2 line 58, having therein above cited "telemetry" network and the whole "tubular drill string 12 is disposed down in "borehole 17");

said drill string comprising: a plurality of tubulars (refer to fig. 1 and see "the [tubular] drill string 12 consists of individual pipe sections, either drill pipe or drill collars connected together in end-to-end relation", col. 2 line 67 – col. 3 line 1) *configured to form an electromagnetic network* ("telemetry" system cited above, comprising "instrument 21", col. 3 line 30, "conductor 40 coupled to the transmitter within instrument 21", col. 3 lines 57-58, and "receiving antenna 43 extending downwards", col. 4 line 19, and see fig. 1 again for "instrument 21", "conductors/antennae 40/43" being coupled together by said "individual pipe sections" of which shown in the figure are "the lower three sections", col. 3 line 1-2) *when coupled to one another* ("drill pipe or drill collars connected together" cited above) *to penetrate a subsurface formation* (fig. 1 "[drill] bit 13", col. 2 line 58, at the tip of "tubular drill string 12" performing "rotary drilling operations", col. 1 lines 27-28);

said tubulars ("pipe sections" cited above) *configured with* antennas *at both ends thereof for signal passage* ("communication link", col. 3 line 43) *along each tubular and between coupled tubulars* (refer to fig. 1, especially downward/upward "receiving/transmitting antenna 43/40" forming said "communication link", and see "The communication link between the instrument 21, located within the well, and the surface

is established by transmitting the data from instrument 21 to the surface via an electromagnetic link", col. 3 lines 43-46, noting that "electromagnetic link" between the "surface" and the "instrument 21" at the bottom of the well will have to be *along each tubular and between coupled tubulars*);

said apparatus comprising: a network interface (fig. 1 "device 26", col. 4 line 66) *in communication with the network* (fig. 1 "device 26 and electric conductor 27", line 67, which "provide means for transferring signals from the receiving antenna within the drill string and kelly to receiver 28", col. 4 line 67 - col. 5 line 1);

a high priority module (fig. 1 "receiver 28") *in communication with the network interface* (above cited "device 26 and electric conductor 27 provide means for transferring signals from the receiving antenna within the drill string and kelly to receiver 28").

Regarding claim 12, *a method for performing an operation* ("method of transmitting signals", col. 1 line 2) *within a deterministic region* (fig. 1 the region confined within the "tubular drill string 12", col. 2 line 58) *on a network* (fig. 1 "telemetry" system, col. 3 line 25, comprising "instrument 21", col. 3 line 30, "conductor 40 coupled to the transmitter within instrument 21", col. 3 lines 57-58, and "receiving antenna 43 extending downwards", col. 4 line 19) *in a downhole drill string* (fig. 1 "drill string 12" disposed in *downhole* "borehole 17", col. 3 line 5. See also col. 3 line 20 through col. 4 line 55 for details of the "telemetering operations" of said "telemetry" network "through electromagnetic coupling between [the] two insulated electric conductors [40 and 43]"), *comprising:*

disposing a column of tubulars (fig. 1 “tubular drill string 12”, col. 2 line 58, and see further “the drill string 12 consists of individual pipe sections, either drill pipe or drill collars connected together in end-to-end relation”, col. 2 line 67 – col. 3 line 1) *downhole* (fig. 1 showing "tubular drill string 12" being *disposed downhole* in “the borehole 17”, col. 3 line 5) *to penetrate a subsurface formation* (fig. 1 “bit 13”, col. 2 line 58, at the tip of “tubular drill string 12” performing “rotary drilling operations”, col. 1 lines 27-28), *the tubulars configured to form an electromagnetic network* (fig. 1 "telemetry" system, col. 3 line 25, comprising “instrument 21”, col. 3 line 30, “conductor 40 coupled to the transmitter within instrument 21”, col. 3 lines 57-58, and “receiving antenna 43 extending downwards", col. 4 line 19, and see fig. 1 again for “instrument 21”, “conductors/antennae 40/43” being coupled together by said “individual pipe sections” of which shown in the figure are “the lower three sections”, col. 3 line 1-2) *when coupled to one another* (“drill pipe or drill collars connected together” cited above);

said tubulars (“pipe sections” cited above) *configured with* antennas *at both ends thereof for signal passage for signal passage* (“communication link", col. 3 line 43) *along each tubular and between coupled tubulars* (refer to fig. 1, especially downward/upward “receiving/transmitting antenna 43/40” forming said "communication link", and see "The communication link between the instrument 21, located within the well, and the surface is established by transmitting the data from instrument 21 to the surface via an electromagnetic link”, col. 3 lines 43-46, noting that "electromagnetic link" between the "surface" and the “instrument 21” at the bottom of the well will have to be *along each tubular and between coupled tubulars*);

a network interface (fig. 1 “device 26”, col. 4 line 66) *in communication with the network* (fig. 1 “device 26 and electric conductor 27”, line 67, which “provide means for transferring signals from the receiving antenna within the drill string and kelly to receiver 28", col. 4 line 67 - col. 5 line 1).

When disclosing *said tubulars configured with* antennas *for signal passage along and between tubulars*, Dawson does not disclose, regarding claims 1 and 12, tubulars configured with *magnetically conductive, electrically insulating elements* at both ends thereof.

However, using what kind of technology, being it wired connection, radio wave, electrical or magnetic coupling etc., through and across the tabulars for *signal passage* is largely a design alternative/addition/preference. There had been many patent documents, at the time of the present Application, that disclosed those technologies/techniques, each having its advantage/disadvantage. Particularly, tubulars configured with *magnetically conductive, electrically insulating elements* at both ends thereof had been an notoriously old and well known technique in the art at the time of the present invention. It can be traced all the way back to 1945 in US 2,379,800 to Hare.

Hare discloses "a method and a means for transmitting [such] signals through a string of drill pipe or tuning from a signaling instrument attached at the lower end of the pipe string to a receiving instrument at the surface, without the necessity of passing a continuous cable through the length of the pipe string or of making electrical

connections between adjacent sections of the string as the latter is being made up" (page 1 left hand column lines 7-15). Hare's invention comprises:

Regarding claims 1/12, *tubulars* (fig. 1 "section 10 and section 12 of internal flush-joint pipe", page 1 right hand column lines 39-40) *configured with magnetically conductive, electrically insulating elements at both ends thereof for signal passage along each tubular and between coupled tubulars* (figs. 1, 4 and 5 "coil 22/24" at lower/upper end of each of said "section", and "these coils are thus disposed so as to be closely adjacent when the coupling is formed", page 1 right hand side column lines 48-50, providing inter-section/tubular "inductive couplings" as page 2 line 31 recites, and in-section/tubular electrical "circuit 32". See further, especially in view of figs. 4 and 5, "when the pipe string is made up the primary coil of one section [e.g., "coil 24" of section 12 – Examiner notes] will be disposed in close proximity to the secondary coil of the adjoining section [e.g., "coil 22" of section 10 – Examiner notes] so that a transformer will be formed at each pipe coupling and a continuous circuit made up of a plurality of separate inductively coupled circuits ["circuit 32" in a section/tubular – Examiner notes] will thus result", page 1 left hand side column line 58 – right hand side column line 4, and thus "forming a continuous circuit extending from a signaling device 34 attached to the lower end of the string to a receiving instrument 36 at the surface", page 2 left hand side column lines 17-20. Noting that the term "inductively coupled circuits" is well known in the art to be *magnetically conductive, electrically insulating elements*).

It would have been obvious to one skilled in the art at the time of the invention to modify the method/system of Dowson by incorporating Hare's magnetically *inductive*

coupled circuits in order to provide an alternative technique for signal passage that overcomes prior art shortcoming in which “it is … extremely difficult to pass a continuous cable through a long pipe string when the sections are being joined" (Hare, page 1 left hand side column lines 37-39).

Having discussed Dawson and Hare, it is noted that Dawson in view of Hare does not expressly disclose, regarding claims 1 and 12, said network interface comprises a network interface *modem* and the other features of claims 1 and 12.

Fechalos discloses "a network interface LSI for use in an improved switching system”, col. 1 lines 6-7, using plurality of “concentrators” (fig. 1a, items 10) in communication with a network (fig. 2 depicting "T1 interface 36" sending/receiving data “to/from host system”). Fechalos’ invention comprises:

Regarding claim 1, *a network interface modem* (fig. 2 "T1 interface 36") and *a high priority module* (fig. 2, a hardware control subsystem, “HWSS” hereinafter, comprised of "CPU 26”, “BIF 40”, “I/O 42”, “DISC 44", “PAD 46”, etc.) *in communication with the network interface modem* (fig. 2 depicting said "HWSS" *in communication with* said “T1 interface” via "primary/secondary bus 30/32”); and further the other features of claim 1, i.e.:

the high priority module (“HWSS”) *comprising a packet assembler/disassembler* (fig. 2 “PAD 46”, or “packet assembler/disassembler (PAD) 46”, col. 5 line 54), *and hardware* (fig. 2, e.g., “CPU 26”, “I/O 42”, etc.) *for performing at least one operation* (figs. 4 and 5, where fig. 4 “illustrating the levels of operation in the concentrator”, col. 2 lines 56-57, and fig. 5 “illustrating the functional operations of the different levels of the

fig. 4 diagram", col. 2 lines 58-59, wherein listed operations including, e.g., at "level 1" "network time slot assignment", "general call processing", etc., at "level 2", "data formatting", "packet assembly", etc., and, at "level 3", "encoded signaling translation", etc.); *and*

at least one deterministic peripheral device (Fechalos discloses various such devices, of which one unique example is fig. 2 "CLK 48", or "clock generator 48", col. 5 line 55, and additionally others, such as "when equipped, the I/O module 42 provides interface between external peripheral devices", col. 5 lines 58-60) *connected to the high priority module* (fig. 2 depicting the connection of said "CLK 48" with the "HWSS" and fig. 1 depicting various other *peripheral devices*, such as "analog and digital subscriber terminal equipment 14", col. 3 lines 31-32, "key telephone subscribers 20", col. 4 lines 14-15, "remote subscribers 22", col. 4 lines 58-59, and even "local area networks (LAN) 24", col. 5 line 16);

wherein the fixed latency hardware ("HWSS") *performs operations on the deterministic peripheral device* (refer to figs. 4 and 5, wherein fig. 4 indicating "level 1" operations by "CPU 26", which operations include, as fig. 5 shows, "General Call Processing" for data calls for, e.g. the "digital subscriber terminal equipment 14" and/or "Key Telephone Subscribers 20" as cited above) *according to instructions* ("routing information", col. 8 line 62) *received and interpreted by the packet assembler/disassembler* (refer to fig. 4 and see "the packet assembler/disassember (PAD) 46 generates routing information requests to the CPU 26 for each data call", col.

8 lines 61-63, noting that such "generates routing information" requires the *packet assembler/disassembler receive and interpret* data packets).

Regarding claim 12, *a network interface modem* (fig. 2 "T1 interface 36") and further the other features of claim 12, i.e.:

proving a high priority module (fig. 2, a hardware control subsystem, “HWSS” hereinafter, comprised of "CPU 26”, “BIF 40”, “I/O 42”, “DISC 44", “PAD 46”, etc.) *connected to a network interface modem* (fig. 2 showing "T1 interface 36" and depicting said "HWSS" *connected to* the “T1 interface” via "primary/secondary bus 30/32”) *in communication with a network* (fig. 2 depicting "T1 interface 36" sending/receiving data “to/from host system” corresponding to fig. 1 "host switching system 12”);

recognizing by the high priority module a packet as the operation (fig. 2 showing, within the “HWSS”, a “PAD 46” or “packet assembler/disassembler (PAD) 46”, col. 5 line 54, which “generates routing information requests to the CPU 26 for each data call”, col. 8 lines 61-63, and said “CPU 26” performs a “level 1” operations, fig. 4, including "General Call Processing", fig. 5, noting it is well known in the art that “general call processing” has to rely on “routing information”); *and*

performing the operation within the deterministic region (“general call processing” have to be processed via the various elements of the "HWSS", such as, for example, fig. 2 "I/O 42” which "provides interface between external peripheral devices", col. 5 line 59-60) *and on a peripheral device* ("when equipped, the I/O module 42 provides interface between external peripheral devices", col. 5 lines 58-60, of which one unique example is fig. 2 “CLK 48”, or “clock generator 48", col. 5 line 55, and fig. 1 also shows

various other types, such as “analog and digital subscriber terminal equipment 14”, col. 3 lines 31-32, “key telephone subscribers 20”, col. 4 lines 14-15, “remote subscribers 22”, col. 4 lines 58-59, and even “local area networks (LAN) 24”, col. 5 line 16);

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus/method of Dawson by adding the network interface modem and other associated features of Fechalos in order to provide a more robust system “such as a network interface LSI, which can function in a switching system capable of assuming different ‘personalities’ depending on the application” (Fechalos, col. 1 lines 33-36), noting the fact that downhole drilling may have various different communication applications between the surface and subsurface.

- **With respect to dependent claims**

Dawson in view of Hare does not but Fechalos does disclose the following features:

Regarding claim 3, *wherein the hardware* (see, e.g., fig. 2 “CPU 26” and “BIF 40”) *of the high priority module* (“HWSS”) *is selected from the group consisting of at least one hardwired circuit, at least one integrated circuit, and at least one FPGA* (fig. 2 depicting *hardwired* "primary bus" 30 linking said CPU and BIF).

Regarding claim 4, *wherein the packet assembler/disassemebler comprises* (fig. 2 "PAD 46”) *a packet assembler and a packet disassembler wherein the packet assembler and the packet disassembler are two separate circuits* (it is well known in the art that a “PAD” in a packet communication device has to have *two separate circuits* in

it, one dealing with outgoing packet assembling and the other with incoming disassembling).

Regarding claim 5, *wherein the at least one deterministic peripheral device is selected from the group consisting of a clock* (fig. 2 “CLK 48” as a "clock generator" which itself must have clocking function)*, a local clock source* (again “clock generator 48”)*, at least one timer* (“CLK 48" is also a timer)*, at least one analog circuit, at least one digital circuit* (fig. 1 “both analog and digital subscriber terminal equipment 14”, col. 3 lines 31-32), *and at least one actuator.*

Regarding claim 6, *wherein the clock is a hardware integrated circuit* (fig. 2 “CLK 48” in a single block suggesting *a hardware integrated circuit*).

Regarding claim 8, *wherein the clock is synchronized to a GPS or a clock source over a LAN* (“a clock means for receiving a predetermined fixed external clock signal and a reset signal for synchronization", col. 2 lines 19-21).

Regarding claim 9, *wherein the high priority module* (“HWSS”) *is in communication with devices selected from the group consisting of a data buffer, at least one router, at least one node, at least one tool port, at least one data acquisition device* (refer to fig. 2 and see “when equipped, the I/O module 42 provides interface between external peripheral devices, such as CRT’s, printers, modems, and tape units”, col. 5 lines 58-61).

Regarding claim 10, *the high priority module* (“HWSS” cited for claim 1) and *the network interface modem* (“T1 interface”) as shown in Fechalos fig. 2. Even though Fechalos does not disclose, in context of fig. 2, that *the high priority module* <u>*is part*</u> *of*

the network interface modem, as recited in claim 10, Fechalos however disclose that the whole circuit of fig. 2 showing “the primary modules in the concentrator” is in fact “the network interface LSI” (col. 1 lines 66-67, which is shown in fig. 1 as “concentrator 10” interfacing the “host switching system 12” with a plurality of peripheral devices 14, 20, 22 and 24). Therefore, it would have been obvious to one of ordinary skill to modify the configuration of fig. 2 of Fechalos, as merely a design alternative, by incorporating the same concept taught by Fechalos himself of integrating the HWSS into the interface, which may provide a more confined network interface unit for space saving purposes and/or possibly faster processing because signals transmitted among various modules may travel a shorter distance than on the buses provided in fig. 2.

Regarding claim 11, *wherein the deterministic region* (fig. 2 showing said region) *encompasses devices selected from the group consisting of the high priority module* ("HWSS"), *the network interface modem* ("T1 interface 36") *and the at least one deterministic peripheral device* ("CLK 48").

Regarding claim 17, *wherein the method further comprises the step of forwarding a packet by the high priority module…*

Regarding claim 14, *wherein the high priority module* (e.g. “CPU 26” in fig. 2) *fills a field in the packet with data from the peripheral device*

(e.g. “digital subscriber terminal equipment 14” of fig. 1, and see fig. 11a depicting an example wherein said "CPU" "Recv. RFS + ID. Find idle TS [time slot]. Format ID, TS, Connect message for BIF", noting the "RFS” originally comes from

“interface” “user ports”, shown also in fig. 11a, and said “format ID, TS” will have to perform relevant *filling a field in the packet with data from the peripheral device*).

Regarding claim 15, *wherein the high priority module* ("HWSS") *connected to a buffer* ("The CPU 26 communicates to the primary bus 30", col. 8 lines 41-42, and “providing each primary bus with a 128 byte buffer”, col. 8 lines 46-47).

Regarding claim 16, *wherein the packet is received from a device selected from the group consisting of a network interface modem, a buffer, a router, a local node, a tool port, and a data acquisition device.*

Regarding claim 17, *wherein the method further comprises the step of forwarding a packet by the high priority module.*

Regarding claim 18, *wherein the packet is forwarded to a device selected from the group consisting of a network interface modem, a buffer, a router, a local node, a tool port, and a data acquisition device.*

(fig. 1 depicting multiple concentrators 10 communicating with each other via "host switching system 12" using "T1" connections. Therefore, such communications inevitably result in, regarding claim 16, that *packet is received from network interface modem*, which is the "T1 interface” shown in fig. 2, and regarding claim 17, *forwarding packets by the high priority module*, and further regarding claim 18, *forwarded to a network interface modem* such as the "T1 interface").

Regarding claim 19, *wherein the packet forwarded is selected from the group consisting of the packet and a packet modified by the operation* (fig. 11a depicting “CPU” “Recv. RFS + ID. Find idle TS [time slot]. Format ID, TS, Connect message for

BIF", which "format ID, TS" will have to involve *a packet* being *modified by the operation*).

Regarding claim 20, *wherein the operation is a high priority operation which is performed immediately upon recognition* ("provide fast response to data call request", col. 8 line 66).

3. Claims 21-25, 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson in view of Hare and futher in view of Tubel et at (US 5,959,547, Tubel hereinafter).

Dawson discloses "a system for performing wellbore telemetry operations" (Abstract line 1) "through electromagnetic coupling between two insulated electric conductors" (Abstract lines 4-6) comprising:

Regarding claim 21 (as best understood), *an apparatus for fixing latency of an operation* ("a communication link between a subsurface location in a well and the surface", col. 2 lines 8-10) *within a deterministic region* (fig. 1 the region confined within the "tubular drill string 12", col. 2 line 58) *on a downhole* (fig. 1 "borehole 17, col. 3 line 5) *network* (fig. 1 "telemetry" system, col. 3 line 25, comprising "instrument 21", col. 3 line 30, "conductor 40 coupled to the transmitter within instrument 21", col. 3 lines 57-58, and "receiving antenna 43 extending downwards", col. 4 line 19, and said "telemetry system, as shown in fig. 1, is disposed down in "borehole 17". See also col. 3 line 20 through col. 4 line 55 for details of the "telemetering operations" of said "telemetry" network "through electromagnetic coupling between [the] two insulated electric conductors [40 and 43]") *integrated in to a drill string* (fig. 1 "drill string 12" disposed also

in *downhole* “borehole 17” and *integrated* therein all of above cited elements of the "telemetry" network);

said drill string comprising: a column of tubulars (refer to fig. 1 and see “the [tubular] drill string 12 consists of individual pipe sections, either drill pipe or drill collars connected together in end-to-end relation”, col. 2 line 67 – col. 3 line 1) *disposed downhole* (fig. 1 showing “drill string 12" down in "borehole 17") *to penetrate a subsurface formation* (fig. 1 “[drill] bit 13”, col. 2 line 58, at the tip of “tubular drill string 12” performing “rotary drilling operations”, col. 1 lines 27-28); *the tubulars configured to form an electromagnetic network* (fig. 1 "telemetry" system, col. 3 line 25, comprising “instrument 21”, col. 3 line 30, “conductor 40 coupled to the transmitter within instrument 21”, col. 3 lines 57-58, and “receiving antenna 43 extending downwards", col. 4 line 19, and see fig. 1 again for “instrument 21”, “conductors/antennae 40/43” being coupled together by said “individual pipe sections” of which shown in the figure are “the lower three sections”, col. 3 line 1-2) *when coupled to one another* (“drill pipe or drill collars connected together” cited above);

said tubulars (“pipe sections” cited above) *configured with* antennas *at both ends thereof for signal passage* (“communication link", col. 3 line 43) *along each tubular and between coupled tubulars* (refer to fig. 1, especially downward/upward “receiving/transmitting antenna 43/40” forming said "communication link", and see "The communication link between the instrument 21, located within the well, and the surface is established by transmitting the data from instrument 21 to the surface via an electromagnetic link”, col. 3 lines 43-46, noting that "electromagnetic link" between the

"surface" and the “instrument 21” at the bottom of the well will have to be *along each tubular and between coupled tubulars*);

said apparatus comprising: a device (fig. 1 “receiver 28”) *near the surface of the downhole drill string* (fig. 1 depicting "receiver 28" next to *the surface of* "tubular drill string 12"), *the device comprises a network interface* (fig. 1 “device 26”, col. 4 line 66) *in communication with the downhole network* (“device 26 and electric conductor 27 provide means for transferring signals from the receiving antenna within the drill string and kelly to receiver 28", col. 4 line 66 - col. 5 line 1).

When disclosing *said tubulars configured with* antennas *for signal passage along and between tubulars*, Dawson does not disclose, regarding claim 21, tubulars configured with *magnetically conductive, electrically insulating elements* at both ends thereof.

However, using what kind of technology, being it wired connection, radio wave, electrical or magnetic coupling etc., through and across the tabulars for *signal passage* is largely a design alternative/addition/preference. There had been many patent documents, at the time of the present Application, that disclosed those technologies/techniques, each having its advantage/disadvantage. Particularly, tubulars configured with *magnetically conductive, electrically insulating elements* at both ends thereof had been an notoriously old and well known technique in the art at the time of the present invention. It can be traced all the way back to 1945 in US 2,379,800 to Hare.

Hare discloses "a method and a means for transmitting [such] signals through a string of drill pipe or tuning from a signaling instrument attached at the lower end of the pipe string to a receiving instrument at the surface, without the necessity of passing a continuous cable through the length of the pipe string or of making electrical connections between adjacent sections of the string as the latter is being made up" (page 1 left hand column lines 7-15). Hare's invention comprises:

Regarding claim 21, *tubulars* (fig. 1 "section 10 and section 12 of internal flush-joint pipe", page 1 right hand column lines 39-40) *configured with magnetically conductive, electrically insulating elements at both ends thereof for signal passage along each tubular and between coupled tubulars* (figs. 1, 4 and 5 "coil 22/24" at lower/upper end of each of said "section", and "these coils are thus disposed so as to be closely adjacent when the coupling is formed", page 1 right hand side column lines 48-50, providing inter-section/tubular "inductive couplings" as page 2 line 31 recites, and in-section/tubular electrical "circuit 32". See further, especially in view of figs. 4 and 5, "when the pipe string is made up the primary coil of one section [e.g., "coil 24" of section 12 – Examiner notes] will be disposed in close proximity to the secondary coil of the adjoining section [e.g., "coil 22" of section 10 – Examiner notes] so that a transformer will be formed at each pipe coupling and a continuous circuit made up of a plurality of separate inductively coupled circuits ["circuit 32" in a section/tubular – Examiner notes] will thus result", page 1 left hand side column line 58 – right hand side column line 4, and thus "forming a continuous circuit extending from a signaling device 34 attached to the lower end of the string to a receiving instrument 36 at the surface", page 2 left hand

side column lines 17-20. Noting that the term "inductively coupled circuits" is well known in the art to be *magnetically conductive, electrically insulating elements*).

It would have been obvious to one skilled in the art at the time of the invention to modify the method/system of Dowson by incorporating Hare's magnetically *inductive coupled circuits* in order to provide an alternative technique for signal passage that overcomes prior art shortcoming in which “it is … extremely difficult to pass a continuous cable through a long pipe string when the sections are being joined" (Hare, page 1 left hand side column lines 37-39).

Having discussed Dawson and Hare, it is noted that Dawson in view of Hare does not disclose, regarding claim 21, the “device” is a *control device*, the “interface” comprises an *interface modem*, and the control device comprises *a high priority module in communication with the network interface modem, and at least one deterministic peripheral device connected to the high priority module.*

Tubel discloses “well control systems employing dowhole network” (col. 1 lines 1-2 and see fig. 2 for "downhole network") using a plurality of "downhole tools and other production equipments" (col. 4 lines 18-19) comprising:

Regarding claim 21, *a control device near the surface of the downhole* tool *string* (fig. 1 “surface control system 24”, col. 9 lines 28-29), *the control device* (fig. 5 “depicting a surface control system”, col. 7 lines 26-27) *comprises a network interface modem in communication with the downhole network* (fig. 5 “surface to borehole transceiver 34”), *a high priority communication module* (fig. 5 “data acquisition & pre-processing 42” and “computer control 30") *in communication with the network interface*

modem (fig. 5 depicting bi-directional communication between "data acquisition & pre-processing 42" and "surface to borehole transceiver 34"), *and at least one deterministic peripheral device* (fig. 5, e.g. “printer plotter 40” or “depth measurement system 44”) *connected to the high priority module* (fig. 5 depicting “printer plotter 40” or “depth measurement system 44” connected to “computer control 30”);

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus of Dawson by adding the control system of Tubel to Dawson in order to provide a more economical control mechanism to overcome the deficiencies of prior art downhole "control system [that] involves the extremely high cost associated with implementing changes in well control and related workover operations” (Tubel, col. 4 lines 22-24).

Dawson in view of Hare does not expressly but Tubel does disclose the following features:

Regarding claim 22, *wherein the control device* (“surface control system 24") *is a computer* (refer to fig. 5 and see “the surface system 24 is composed of a computer system 30", col. 9 line 48).

Regarding claim 23, *wherein the network interface modem* (“surface to borehole transceiver 34”) *and the high priority module* (“data acquisition & pre-processing 42” and “computer control 30") *are on an insertable computer card* (“computer system 30 may be comprised of a personal computer or a work station with a processor board”, col. 9 lines 50-52).

Regarding claim 24, *wherein the control device* ("surface control system 24") *further comprise a connection to a local area network* (fig. 1 depicting "surface control system 24" having wireless *connections to a local area network* comprised of various "surface control systems 24" and "a remote central control center 10", col. 8 line 42).

Regarding claim 25, *wherein the at least one deterministic peripheral device is selected from the group consisting of a local clock source, at least one analog circuit, at least one actuator, a lock and a hardware clock integrated circuit* (figs. 5A and 5B, as "a preferred system [part of fig. 5] for sensing downhole pressure condition", col. 10 lines 42-43, showing a "EPLD 304" which is "comprised of six counters", col. 10 lines 57-58, one of which is "pulse counter", fig. 5B, which further has "the clock in the pulse counter", col. 11 line 4. Therefore, the entire structure suggests *a clock* or *a hardware clock integrated circuit*).

Regarding claim 29, *wherein the deterministic region* (fig. 5) *encompasses devices on the network* (all modules in fig. 5 are *on the* downhole network) *selected from the group consisting of transmission media* ("the downhole network consists of an interconnecting cable", col. 22 lines 49-50), *the high priority module* (fig. 5, e.g. "computer control 30), *the network interface modem* (fig. 5 "surface to borehole transceiver 34"), *and the at least one deterministic peripheral device* (fig. 5, e.g., "printer plotter 40").

Regarding claim 30, *wherein a downhole device* ("downhole control system") *comprises non-deterministic devices selected from the group consisting of a data buffer* (fig. 6 "recorder 66A"), *at least one router, at least one node, local node circuitry, at*

least one tool port (fig. 6 “electro mechanical drivers 60”) *and at least one data acquisition device* (fig. 6 “data acquisition system 54”)

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson in view of Hare and Fechalos, as applied to claim 5 above, and further in view of Jain et al (US 4,608,685, Jain hereinafter).

Dawson in view of Hare and Fechalos discloses claimed limitations in section 2 above including a *local clock source* (Fechalos, fig. 2 "CLK 48” or “clock generator 48”). Dawson in view of Hare and Gechalos does not disclose other features for claim 7.

Jain discloses an invention wherein “a telecommunications network being operable as a packet switch and as a circuit switch” (Abstract lines 1-2) using plurality of "bus controllers” (fig. 1) each having an internal "clock generator” (fig. 2 “clock generator 205”) comprising:

Regarding claim 7, *wherein the local clock source* (“clock generator”) *is selected from the group consisting of at least one crystal, at least one transistor, at least one oscillator, at lease on RC circuit, at least one LC circuit, and at least one RLC circuit* (Jain’s fig. 2 "clock gen. 205" and see "the clock generator in one example consists of an internal crystal oscillator", col. 5 lines 54-56).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the system of Dawson by adding the clock crystal oscillator of Jain in order to provide an accurate timing mechanism that "accommodates communication of digital signals of asynchronous and synchronous natures respectively” (Jain, col. 1 lines 11-13).

5. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson in view of Hare and Tubel, as applied to claim 25 above, and further in view of Jain.

Dawson in view of Hare and Tubel discloses claimed limitations in section 3 above including a *local clock source* (Tubel, "the clock in the pulse counter").

Dawson in view of Hare and Tubel does not disclose other features for claim 26.

Jain discloses an invention wherein “a telecommunications network being operable as a packet switch and as a circuit switch” (Abstract lines 1-2) using plurality of "bus controllers” (fig. 1) each having an internal "clock generator” (fig. 2 “clock generator 205”) comprising:

Regarding claim 26, *wherein the local clock source* (“clock generator”) *is selected from the group consisting of at least one crystal, at least one transistor, at least one oscillator, at lease on RC circuit, at least one LC circuit, and at least one RLC circuit* (Jain’s fig. 2 "clock gen. 205" and see "the clock generator in one example consists of an internal crystal oscillator", col. 5 lines 54-56).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the clock in the pulse counter of Tubel by incorporating the clock crystal oscillator of Jain into Tubel in order to provide an accurate timing mechanism that "accommodates communication of digital signals of asynchronous and synchronous natures respectively” (Jain, col. 1 lines 11-13).

6. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson in view of Hare and Tubel as applied to claim 25 above, and further in view of LoGalbo et al (US 5,220,676, LoGalbo hereinafter).

Dawson in view of Hare and Tubel discloses claimed limitation in section 3 above including that *the clock is synchronized* (Tubel, "provide the synchronization between the devices that are attempting to setup communications link", col. 21 lines 64-65, noting that such "synchronization between the devices" actually means synchronization of the *clocks* therein).

Dawson in view of Hare and Tubel however does not disclose, regarding claim 27, clock synchronization *to a GPS clock.*

LoGalbo discloses "an improved synchronization method and apparatus" (Abstract line 1) for "remote sites in an absolute time simulcast system" (col. 1 lines 7-8) comprising:

Regarding claim 27, *the clock is synchronized to a GPS clock* (refer to fig. 4 and see "one method of synchronizing the remotes 421, 431 together and to the prime 403 is to have a remote synchronization clock which is derived from a signal 415 received from a GPS satellite 401", col. 2 lines 58-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the downhole network system of Dawson by adding the GPS synchronization method of LoGalbo to Dawson in order to provide precise mechanism "for synchronization that will achieve [better] signal timing shown in [LoGablbo's] fig. 3" (LoGalbo col. 1 lines 62-63) wherein "the corresponding sinusoidal signals are correctly

aligned with respect to time and phase" (col. 2 lines 3-5), which is especially important for, for example, oil industrial application involving time precise operations of downhole tools.

7. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dawson in view of Hare and Tubel as applied to claim 21 above, and further in view of Fechalos.

Dawson in view of Hare and Tubel discloses claimed limitations in section 3 above including Tubel disclosing *the high priority module* (fig. 5, e.g. "computer control 30") and *the network interface modem* (fig. 5 "surface to borehole transceiver 34").

Dawson in view of Hare and Tubel however does not expressly disclose, regarding claim 28, said "computer control 30" *is part of the* "surface to borehole transceiver 34".

Fechalos discloses "a network interface LSI for use in an improved switching system", col. 1 lines 6-7, which "network interface LSI" is in the form of "concentrator" (fig. 1a depicting "concentrator 10" interfacing "host switching system 12" with various peripheral devices 14, 20, 22 and 24) comprising:

Regarding claim 28, *wherein the high priority module* (fig. 2, e.g. "CPU 26") *is part of the network interface modem* (the "concentrator 10").

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the control systems of Dawson by incorporating the interface configuration of Fechalos into Dawson in order to provide a more robust and user friendly system "which can function in a switching system capable of assuming different personalities depending o the application" (Fechalos, col. 1 lines 33-36).

Response to Arguments

8. Applicant's arguments with respect to all Independent claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant's argument is over the newly added limitations to Independent claims 1, 12 and 21, i.e. "*said tubulars configured with magnetically conductive, electrically insulating elements at both ends thereof for signal passage along each tubular and between couple tubulars*" (emphasis added, see Applicant's Remarks pages 7 through 9).

While Dowson indeed does not disclose said feature, which however appears to be a design alternative/addition to one skilled in the art because a large variety of techniques had been known at the time of the present invention, newly found art of Hare clearly and expressly teaches such and thus renders the argument moot.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW LAI whose telephone number is (571)272-9741. The examiner can normally be reached on M-F 7:30-5:00 EST, Off alternative Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang Yao can be reached on 571-272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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